

**FLOOD BASALTS AND MASS EXTINCTIONS, W. Jason Morgan,
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There appears to be a correlation between the times of flood basalts and mass-extinction events: Siberian Traps = Permo-Triassic event (≈ 245 Ma), Karoo = Pleinsbachian-Toarcian event (≈ 193 Ma), Ferrar Dolerite = Bajocian-Bathonian event (≈ 176 Ma), Serra Geral = ? Hauterivian-Barremian time (≈ 124 Ma), Rajmahal Traps = Aptian-Albian event (≈ 113 Ma), Deccan = K-T event (≈ 66 Ma), Ethiopian Traps = upper Eocene-Oligocene event (≈ 37 Ma) and Columbia River Basalts = early-mid Miocene event (≈ 17 Ma). There are notably 3 extinction events with no recognized flood basalt: Norian-Hettangian (≈ 208 Ma), Jurassic-Cretaceous (≈ 144 Ma), and Cenomanian-Turonian (≈ 91 Ma) -- perhaps there are oceanic equivalents to continental flood basalts such as the basin-wide sills of the Eastern Caribbean or Nauru Basin or the Ontong-Java Plateau.

There is a correlation of flood basalts and hotspot tracks -- flood basalts appear to mark the beginning of a new hotspot. Perhaps there is an initial instability in the mantle that bursts forth as a flood basalt but then becomes a steady trickle that persists for many tens of millions of years. Some of the extensive basalt flows on land (e.g. Skaergaard, and perhaps Rajmahal) are perhaps not associated with the initial burst of a new hotspot but are influenced by excess volcanism caused by a hotspot being near a new rift.

Suppose that flood basalts and not impacts cause the environmental changes that lead to mass extinctions. This is a very testable hypothesis: it predicts that the ages of the flows should agree exactly with the the times of extinctions. The Deccan and Siberian are the largest flood basalts and they correlate with the largest extinctions. The Deccan and K-T ages agree with this hypothesis; the Siberian Traps are not well enough dated for an exacting test. Two flood basalts have been well dated: the Deccan (\checkmark) and the Columbia River. The time of the Columbia River Basalts does not coincide with the larger mid-late Miocene extinction (12 Ma) but it does correlate with an earlier, smaller early-mid Miocene extinction (17 Ma). The larger mid-late Miocene event appears to correlate with the onset of colder waters, it may be entirely due to this climatic shift. The smaller early-mid Miocene event is not insignificant, it is the second largest extinction within the Neogene. The Columbia River Basalts are a fraction ($\approx 20\%$) of the size of the Deccan or Siberian Traps, perhaps the smaller size of this extinction does agree proportionally.

An iridium anomaly at extinction boundaries apparently can be explained by a scaled-up eruption of the Hawaiian type; the occurrence of shocked-quartz is more of a problem (diatremes as the flood basalts initially break through?). However if the flood basalts are all well dated and their ages indeed agree with extinction times, then surely some mechanism to appropriately produce shocked-quartz will be found.